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Sensitivity of hydrological response of medium ungauged catchments to rainfall fields estimation and soil variabilities in the context of flash floods

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Flash floods result from the combination of meteorological and hydrological conditions.
Recognition of the coupled meteorological / hydrological nature of flash floods is now evident in interpretative studies and in the development of predictive models. There is a real need for research to improve the understanding of the major atmospheric and hydrologic factors leading to extreme flood events, especially those affecting small to medium ungauged
basins.
It has been shown that most of flash flood events can be attributed to stationary Mesoscale Convective Systems (MCSs). Due to their very localized nature, the observation of such event using a gauging network is problematic. Weather radars can provide better spatial rainfall
estimations, even if radar assessment of rainfall can be significantly influenced by the orography itself. Therefore accurate monitoring of severe storm rainfall intensities remains a major challenge.
In terms of the hydrological processes associated to flash flood, it is known that the knowledge of the soil characteristics is an important source of uncertainty in the understanding of the hydrological behavior of the catchments.
This contribution presents a modelling approach aiming at quantifying the respective impact of rainfall estimation and soil variability on the simulated discharge for an extreme event in southern France. The method is illustrated for two ungauged medium size basins using different radar and gauge rainfall estimates and an existing soil data base.
The hydrological distributed modelling approach was implemented within the numerical modelling LIQUID platform on the Cévennes-Vivarais region, used without any calibration phase, and validated with a regional approach using distributed post-flood estimation (Braud
et al., EGU2009).
For the same event, previous work using an event-based TOPMODEL approach with a calibration phase, showed that the model efficiency significantly increases when the spatial variability of rainfall is taken into account. Nevertheless, for some of the catchments, the
mis-performances remained unexplained.
The model was run using different radar image treatments and the sensitivity on the hydrological response was assessed. The results show the important contribution of the volume-scanning protocol for the quantitative radar rainfall estimation at regional and local
scale. Nevertheless, this study also highlights the importance of the description of the soil types to properly set up the hydrological model.